

It will be seen that the month of maximum rainfall is also the month of maximum growth. The two records for September show a deviation from the rule. October, 1898, shows a relation quite different from that of the same month in the other two years. It is not likely that the trees could use a high per cent of the abnormal precipitation for September, 1900. There was a distinct falling off in the growth for June, 1901, as compared with the same month in the other years, probably due to lack of rainfall during that month. The growth for May, 1901, as compared with the precipitation for that month can not be attributed to the heavy rainfall during the latter part of the previous month, because the records show that not more than an inch fell on any day, except the 10th, with 1.50, and the 28th, with 1.04.

TABLE 2.—*Rainfall and average width of annual rings of growth for 42 trees.*

	Year.												
	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.
Rain or melted snow in inches.	29.92	31.29	19.30	22.80	35.20	33.61	31.72	23.67	31.62	32.49	38.50	31.53	23.08
Average width of ring, in inches.	1.174	1.157	1.059	0.864	1.236	1.359	1.336	1.195	1.421	1.371	1.595	1.645	1.376

Table 2 gives the average width of ring of 42 trees of 15 different species measured on the stump to hundredths of an inch and the rainfall for each year during the period from 1892 to 1904, both inclusive. These data were gathered at

Agricultural College, Mich., about four miles east of Lansing and within a radius of one mile of the observation station from trees that had not suffered any radical change in environment during that time.

The small amount of rain in 1894 appears in the tree growth of the following year, and the abnormally large amount of precipitation in 1902 probably had some influence on the width of ring in 1903. The numbers, rounded off, show that a precipitation of from 30 to 35 inches in this latitude ($42^{\circ} 45' 56''$) gives a width of ring from 0.11 to 0.15 inch and that abnormally large or small precipitation is evidenced by the tree growth of the following year. The young leaves and long tender shoots that are put out during the early part of any season in this latitude are evidently formed from material that was stored the previous season. There is now at hand a section of a butternut stem, about four inches in diameter and four feet long, that was cut and put into storage last winter, 1904-5, that has sent out two sprouts, one five and the other ten inches long. The piece has been standing on a cement floor in a barn where no moisture was available except from the air. Piles of logs and logs of houses have often demonstrated the same thing.

In Table 1 it will be noticed that in some cases, all in the winter months, the average was less for a certain month than for the month previous. This obtains because of the frozen trees at time of measurement, the frozen stem being smaller than at zero centigrade.

We may conclude that there is a general direct relation between precipitation and tree growth.

NOTES AND EXTRACTS.

THE SCIENTIFIC STAFF OF THE WEATHER BUREAU.

Readers of the MONTHLY WEATHER REVIEW will be interested to learn that on the first of July the force of the Weather Bureau was notably increased by the appointment of (1) Prof. William J. Humphreys, of the University of Virginia, as Professor of Meteorological Physics, assigned in charge of Mount Weather Observatory; (2) Mr. James Page, of the U. S. Hydrographic Office, as Section Director in charge of the Division of Ocean Meteorology; (3) Mr. Louis G. Schultz, of the Magnetic Survey of the Argentine Republic, as Research Director, assigned in charge of the magnetic work at Mount Weather; and (4) Mr. Herbert L. Solyom, of the U. S. Patent Office, as Research Observer, temporarily assigned to the Yerkes Observatory of the University of Chicago, at Williams Bay, Wis.

In connection with these important appointments, preparatory to the research work at Mount Weather, we note also the assignment of Mr. H. H. Kimball, Librarian and Climatologist, to special work at the Astrophysical Observatory of the Smithsonian Institution, where he will conduct bolometric work during the present summer. This assignment reminds one of the analogous cases that occurred in 1883 when Messrs. McAdie, Morrill, Fassig, and McRae were sent to study electrical methods under the famous electricians at Harvard, Yale, and Johns Hopkins preparatory to the work of the service in atmospheric electricity.

These appointments respond to the current needs of the service in three different directions. Professor Humphreys brings with him the reputation of being fully up to date in all that relates to experimental physics, and his assignment to the Mount Weather Observatory gives assurance that the work at that institution will satisfy the most exacting demands.

Mr. Schultz, who has for some years been absent from the service, on furlough, first conducting magnetic work for the U. S. Coast and Geodetic Survey at Cheltenham, Md., and sub-

sequently organizing the magnetic work of the Argentine Republic, now returns from inspecting European stations and goes to conduct similar work at Mount Weather.

Mr. Page, who has long been connected with the Hydrographic Office of the U. S. Navy Department, and has been widely known as the editor of the Pilot Chart and the author of many excellent articles relative to ocean meteorology, is now transferred to the Weather Bureau, to which the study of ocean meteorology has also been entrusted.

Eventually Mr. Solyom will do work at Mount Wilson, Cal., in atmospheric physics for comparison with similar work at Mount Weather.

These appointments, marking, as they do, the beginning of a brilliant epoch in the history of the Weather Bureau, may also be looked upon as celebrating in the most appropriate manner the tenth anniversary of the appointment of our Chief to his present position. It is very important that the service should be strengthened in the direction of physical and mathematical research; for many years it has been stated, as a criticism of the policy of the service, that we have not encouraged the ablest men in the country to take up the study of meteorology, and, therefore, those who would gladly have devoted themselves to our work have carved out for themselves brilliant careers in other branches of science, leaving meteorology alone until the Weather Bureau shall see fit to encourage them. There are, perhaps, a half dozen well known men who stand in this category, and doubtless before many years have passed some of these, or their students, will have to be set at work upon our problems.

Everyone must recognize the fact that the great desire of Prof. Willis L. Moore has been to secure harmony among the employees and enthusiastic devotion to the interests of the service; this also means devotion to the best interests of meteorology, since our knowledge of that science and our expertness in its practical applications must be increased if the work of the Weather Bureau is to retain the support, the confidence, and the affection of all classes of citizens. At the

present time we believe that intelligent Americans appreciate the storm, weather, and flood services as heartily as they do the work of any other branch of the Department of Agriculture, or as they do the work of our Navy, or the charts, hydrology, and geology of the Geological Survey. In fact the Fish Commission, the Forestry Division, the Bureau of Animal Industry, the Bureau of Plant Industry, the Geological Survey, the Coast Survey, and the Weather Bureau vie with each other in their efforts to serve the country and advance the welfare of every individual. Every one seems to look most expectantly and anxiously to the Weather Bureau to make still greater advances and ultimately to solve the problem of making successful long-range forecasts. Now this problem can only be solved, if at all, by studying the whole atmosphere as a unit. The Weather Bureau needs to study both the ocean and the land, both the polar and the equatorial regions, both the lower and the upper atmosphere; an international chart of the world must be published daily, and the resumption of our former work in ocean meteorology is undoubtedly a step toward realizing this desideratum. The atmosphere up to its greatest height must be studied by means of the polarimeter, the actinometer, the balloon and kite ascensions; and the Mount Weather Research Observatory will undoubtedly carry out such work. Our problems in the mechanics of the earth's atmosphere must consider not any one layer alone, but the whole envelope of the globe. If we neglect viscosity, diffusion, and vertical variation of gravity as matters of minor importance, we must take full account of the irregularities of the earth's surface, and the variations of atmospheric pressure, temperature, and moisture. Whether or no we must take account of the variations of the solar radiation is generally considered problematical. If, as some believe, there are important relations between meteorological phenomena and those of terrestrial magnetism and solar physics, then the magnetic work at Mount Weather may give the data for the elucidation of that branch of science.

The following general statement of the organization of the special research staff of the Weather Bureau has been authorized by the Chief of Bureau:

AT WASHINGTON.

Director.—The Chief.

Board of advisers.—Prof. Cleveland Abbe, Prof. Charles F. Marvin, Prof. Frank H. Bigelow (*chairman*), Prof. Edward B. Garriott, Prof. Henry J. Cox, Prof. Alfred J. Henry, Prof. Alexander G. McAdie, Prof. Harry C. Frankenfield, and Prof. William J. Humphreys.

AT MOUNT WEATHER.

Supervising director.—Prof. William J. Humphreys, who shall have detail supervision of all work in the physical laboratory and solar physics observatory and general, rather than detail, supervision of other researches. He will aid the research directors in matters wherein his knowledge may be of assistance, and will be an adviser rather than a director of their research; although in all matters of cooperation between research directors he will have the controlling voice. He will have charge of the discipline of the institution, referring to the Chief such matters as can not be settled at the station.

Mr. Herbert H. Kimball, who, through the courtesy of Prof. S. P. Langley, is receiving special training at the Smithsonian Institution in the use of the bolometer, will be Professor Humphreys's principal aid in solar physics, and Mr. Herbert L. Solyom, who, by the kindness of Prof. E. B. Frost, is doing special work at the Yerkes Observatory, will be an additional assistant.

Director of magnetic and electric research.—Mr. Louis G. Schultz, who shall have charge of the magnetic observatories and observations in atmospheric electricity and special electric and magnetic research.

Director of upper air research.—Dr. Oliver L. Fassig, who shall have charge of balloon and kite observations and the discussion thereof. Messrs. Schultz and Fassig will arrange for cooperation in the taking of electrical observations from kites.

Observer in charge of property.—Mr. Charles S. Wood, who, under the general control of the supervising director, shall have charge of the premises, repairs, improvements, heating and lighting, power plants, horses and vehicles, meteorological observations and forms, and the mess and the forage funds. He may correspond direct with the central office in regard to the details of the work with which he is charged.

Each official will discuss his own observations and, so far as possible, correlate the events shown by his reports with those indicated by the observations of others. There will be a cheerful willingness to cooperate

for the general good of the institution and the advancement of the science of meteorology.

There will be no publication in the bulletins of the Bureau of mere argument of abstract theories in science. The place for such is in scientific publications, which are open to all. No more data will be published in the announcement of results than are necessary to make clear the subject matter, except when the data are new.

The prime object of the institution, which is the taking of observations and the gathering of data with which to make experimentation and prosecute research, will be kept in mind. Unpublished data will be open to the use of all recognized investigators, and cooperation with other scientific workers will be encouraged. Questions that may directly or indirectly be of value to the science of meteorology will be proper subjects for investigation. The field of inquiry will, therefore, be a broad one.

INVENTIONS PATENTED BY GOVERNMENT EMPLOYEES

The following is the text of Circular No. 3 of the Department of Agriculture, mentioned on page 209, of the MONTHLY WEATHER REVIEW, for 1905.

Hereafter whenever any employee of the Department makes any new and useful discovery or invention of any machine, device, or process connected with the work of the Department, through the expenditure of Government time and Government money, he is directed to cause a patent to be applied for on the said discovery or invention, through the law officer of the Department, i. e., the Solicitor. The patent will be taken out in the name of the inventor, without any expense to him, and will allow to any citizen of the United States the use of the patented article or process without payment of royalty.

All employees of this Department are prohibited from patenting any device or process or discovery connected with the work of the Department except in the manner above described.

SEISMOLOGY IN THE UNITED STATES.

Inasmuch as the gentlest earthquake sets into oscillation, from a purely gravitational point of view, the magnetic needles that record their positions photographically in the standard magnetic observatories, therefore the Coast and Geodetic Survey keeps an independent record of earthquakes at its magnetic observatories at Cheltenham, Md.; Honolulu, Hawaii; Sitka, Alaska; and Isabel, Vieques Island, near Porto Rico. Similar records are also kept at Toronto, Ont.; Victoria, B. C.; Baltimore, Md.; Mount Hamilton, Cal.; St. Louis, Mo., and the Weather Bureau at Washington. In addition to the mechanical disturbance of magnetic records there are also some occasions on which earthquakes seem to be accompanied by true magnetic disturbances. In still other cases distinct and continuous earth tremors appear to be associated with certain meteorological conditions.

For many years the earthquakes recorded by both regular and cooperative observers of the Weather Bureau were published in the MONTHLY WEATHER REVIEW, in order that the data might become available to students of seismology. Recent arrangements have, however, been made by which American earthquake data will be published both by the U. S. Geological Survey and in Dr. Bauer's international quarterly journal "Terrestrial Magnetism and Atmospheric Electricity." Therefore, the MONTHLY WEATHER REVIEW will hereafter confine its notes on earthquakes to the publication of records at its own stations and such special cases as appear to require notice in our columns.

At the urgent request of the Editor, a general earthquake committee was appointed in 1882, and eventually the U. S. Geological Survey concluded to give some attention to this subject, which truly belongs to geophysics as a part of geology.

According to the 25th Annual Report of the Director of the U. S. Geological Survey, Prof. Harry Fielding Reid, of the Johns Hopkins University, has been placed in charge of earthquake data as a special expert. The report says: